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# East Europe Report

SCIENTIFIC AFFAIRS

No. 794

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# EAST EUROPE REPORT SCIENTIFIC AFFAIRS

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## INTERNATIONAL AFFAIRS

### BLOC SCIENTISTS DISCUSS BIOTECHNOLOGY COOPERATION

#### Biographic Data on Participants

East Berlin SPECTRUM in German Vol 14 No 8, Aug 83 pp 14-14

[Photo captions identifying participants in the 3rd Symposium for Biotechnology in Socialist Countries held late April in Bratislava]

[Text]

Caption: Prof. Janos Hollo (left), member of the Hungarian Academy of Sciences and Director of the Central Institute for Chemistry. He teaches at Budapest University. Prof. Martin Becker (right) is a member of the Academy of Sciences of the Latvian SSR and Acting Director at the Institute for Microbiology "August Kirchenstein".



Caption: Prof. Christo Panayotov (left) is Director of the Department of Technical Biology at the Biological Faculty of the Sofia University. Prof. Manfred Ringpfeil (right), member of the Academy of Sciences of the GDR, manages the Institute for Technical Chemistry in our Academy.



Caption: Prof. Vladimir Krumphanzl is Director of the Institute for Microbiology of the Czechoslovak Academy of Sciences; this Institute was among the organizers of the Third Symposium for Biotechnology in Bratislava.



#### Round Table Discussion

East Berlin SPECTRUM in German Vol 14 No 8, Aug 83 pp 14-17

[Interview by SPECTRUM Deputy Ed.-in-chief Sonnhild Kutschmar with Profs. Martin Beker, USSR; Janos Hollo, HUNGARY, Vladimir Krumphanzl, CSSR; Manfred Ringpfeil, GDR; Christo Panayotov, BULGARIA; date and place not give; "Biotechnology: Successes, Pressures, Prospects"]

[Text] About 400 scientists from 17 countries met in Bratislava at the end of April for the Third Symposium on Biotechnology in the Socialist Countries.

The scientific institutes and institutions of the CSSR sent out the invitations; the conference was organizationally managed by the Czech College in Bratislava. The series of symposia, which opened in Riga in 1977, in the meantime has become an important forum for an exchange of ideas about all areas of biotechnology. From our academy, scientists from various institutes participated. Through lectures, discussions, and posters, they enriched the program of the Symposium.

In the past, "Spectrum" has already reported on numerous problems of biotechnological research, such as biogas (No 10/1982) and pipe reactors (No 21/1980), decomposition of manure (Nos 7 and 8/1978), as well as feed yeast production (No 4/1982). This time we had the opportunity to talk with experts from five Socialist countries about tasks, results, and current problems of biotechnology. During the Symposium it became clear that in the future, greater attention must be paid especially to genetics and to scientific device construction for biotechnological research and applications.

Kutschmer: The Second Symposium for Biotechnology in Socialist Countries took place in 1980 in Leipzig. What new trends and results can be delineated today, three years later, in this scientific discipline?

Prof. Hollo: First of all, here at the Symposium in Bratislava there was a section where we discussed problems of gene manipulation from a biotechnological perspective.

I consider this great progress. True, even three years ago, we suspected how important these methods are, but the biologists were not yet convinced of their technical applicability. Of special interest for me are the results of basic research, which become effective in process engineering. A trend is that cellulose may be a new raw material for microbiological processes. Major technological applications here still sound like the music of the future.

Prof. Ringpfeil: Professor Hollo, you say what all of us have at heart: the close connection between genetics and biotechnology. First successes are appearing here. Since 1980, we additionally have obtained a series of new insights on the intensification of technical processes.

Prof. Panayotov: More pointedly, one can say that, since the Leipzig Symposium, we know better what biotechnology is. In the meantime, good examples arose for the application of biotechnology. I need think only about the production of feed protein from petroleum distillates according to the fermentin process, which the Soviet Union and the GDR worked out jointly.

Prof. Beker: From the Second Symposium for Biotechnology, a series of impulses emanated for the progress of our discipline. After the Central Committee of our Party, at the end of 1981, decided on the specific tasks for developing the physical, physical-chemical, biological, and biotechnological sciences, the foundation for biochemistry, genetics, and molecular genetics, as well as their coordination were expanded with the technological directions. Since that time, there exists a substantive conception which comprises the products that are obtained by a biotechnological route.

After the Second Symposium, at the initiative of Prof. Ringpfeil, the journal "Acta Biotechnologica" was founded. Here we now have the possibility of publishing our results for the use of all and of deepening the scientific exchange of opinion.

In recent years we gained important knowledge through the discovery of enzymes which participate in the conversion of natural substrates such as cellulose, called bioconversion. In the meantime, we are setting up a special symposium series on problems of bioconversion; the first one took place last year in Riga.

Prof. Krumphanzl: For me, one of the most important advances of recent times consists in the fact that genetics has been developing at the boundary between chemistry and biotechnology. It is even my opinion that biotechnology begins only with genetic engineering.

Prof. Ringpfeil: An important keyword! But genetics in a certain sense is our problem child. If we wish to use it properly, it is not enough merely to insert the genetically manipulated microorganism into a process, but we must intensify the entire process. We thus face the requirements, especially of the chemical industry, with respect to the intensity, stability, and concentration of production. If we do not master these tasks to the required extent, we will frequently not be able to use the opportunities which genetically manipulated organisms offer us.

Prof. Hollo: I do not quite share the ideas of my colleague Krumphanzl. Biotechnology underwent its first upswing already through the use of the process-technical scientist. If we think about large-scale production of antibiotics like penicillin

and streptomycin. I would like to warn against the illusion of expecting progress in biotechnology in the future only from genetic manipulation.

Kutschmar: How is biotechnology becoming economically important in your countries?

Prof. Beker: Perhaps my prophecy sounds very bold, but I believe that the coming century will be the century of biotechnology. In the Soviet Union, we have hitherto achieved great successes by means of biotechnology. I am here thinking about the production of feed yeast from wood wastes in industry, which up to now exist in no country in the world, but also about the large-scale production from non-traditional substrates, such as paraffin, natural gases, and ethanol. Here, new economic branches have arisen. For this purpose, we have instituted a top management, at the rank of a ministry, which secures transfer of research results into production. On the basis of genetic engineering, we are producing amino acids such as lysine beyond our own need even for the CEMA countries. Biotechnology is gaining increasing influence on the intensification of agriculture. With its help, we are obtaining bacterial fertilizers, plant protective agents, and preparations for the treatment of seeds.

Let us always keep before our eyes that microbiological processes are economical because they proceed without high pressures and without high temperatures and have a low energy requirement. We know a series of products which cannot be fabricated at all chemically, but which frequently can be fabricated microbially quite favorably.

Prof. Krumphanzl: The development of biotechnology in the CSSR was connected with some difficulties. By this I mean, for example, the availability of raw materials. As is well known, the situation in the Soviet Union is less tight because of the availability of petroleum. The second problem arose from the corresponding production strains which could not be obtained so easily. But if we wish to develop biotechnology on a large scale, these are the most important questions that must be solved. On the other hand, I do not deem process design and automation as being of the highest priority.

Prof. Hollo: "Enzymatic brewing", that is the use of bacterial brewery enzymes in place of malt, belongs among the economic tasks which we have already solved in Hungary by means of biotechnology. In the meantime, 70 percent of our beers are produced in this fashion. This conversion took place without the consumer being aware of it. In any case, Hungarian beer is now not any worse.

Prof. Krumphanzl: Yes, colleague Hollo, what you mean by beer...

Prof. Hollo: Admittedly, our beer is not as famous as yours. With us, corn grows better than hops. If we refine our corn, we obtain valuable products which can be sold at a higher price than the raw material itself. For this, we have built a new plant where we process the corn biotechnologically. In particular, we daily produce about 400 tons of starch, isosugar, glucose, and alcohol. In this plant, immobilized enzymes are also used for the isomerization of sugars. But I wish to return once again to the big discussions between the chemists and biotechnologists concerning the synthesis of drugs, which my colleagues will surely remember. Unfortunately, the chemists first won at that time. In the meantime, everyone knows that biotechnical production has captured the place of the "old line".

Prof. Beker: During the days in Bratislava, especially two problems emerged: the energetic evaluation of the biotechnological raw material and its processing. Prof. Hollo explained how complex the technology can be designed in the processing of corn. The problems mentioned by me should also be regarded in the refining of other raw materials, for example in processing alfalfa to protein concentrate. Furthermore, one can obtain acids and ethanol from the juice of this plant. We often invoke the "closed materials cycles". In order to obtain these, methane fermentation will in many cases have to stand at the last point in the process. Beyond the appropriate products, one could even still obtain energy here.

Prof. Ringpfeil: In the GDR, we are using biotechnology especially in the chemical and pharmaceutical industry. According to the decisions of the 10th Party Congress, which took place between the Second and Third Symposia, biotechnology is being expanded further by us. We believe that thus we can obtain progress especially in agriculture, to intensify the inner cycles and to penetrate there with industrial methods. I am here thinking about the production of feeds, biogas, and special fertilizers. Thus, by means of biotechnology, we can make a contribution towards increasing our agricultural production and towards utilizing raw materials better. Furthermore, it is important to use biotechnological principles also in the food-stuffs industry. Prof. Hollo already mentioned the "enzymatic brewery". In the GDR, such methods will in the near future probably affect alcohol production.

Prof. Panayotov: In Bulgaria, the microbiological industry has a tradition of many years; especially in the production of antibiotics, the production of proteins for animal nutrition, and the production of plant protecting agents. Unfortunately, in recent years, there have been no significant practical advance developments in biotechnology. However, I am optimistic in this connection. But money, time, and understanding will be necessary.

Prof. Ringpfeil: By means of biotechnology, we have also further advanced the construction of chemical systems. The chemical installations decided at the proper time to produce systems and apparatus for biotechnology. This is a significant success, because in this way special systems, including measuring and computer technologies, become available for production of microbial protein, alcohol, biogas, and other products.

Kutschmar: Along what new directions is biotechnology orienting itself?

Prof. Beker: In the first place, one would here have to mention the methods of genetic engineering; in the future, we must pay greater attention to this. Just think about the synthesis of such natural compounds which previously could not be obtained by microbiological means, for example the human interferon. It would be of great use for all of humanity if we could succeed in administering to all the relevant persons interferon as an antiviral preparation and as an antitumor factor. On our planet, technology and industry are developing at a perfectly mad pace, and the other side of the coin is, among other things, that the environment is being polluted. This requires from us more attention to this problem and simultaneously to attempt to generate useful products from waste. Methane fermentation would be a good example of this.

Prof. Ringfeil: Up to now - I believe - we biotechnologists have technically processed only a vanishingly small part of the material conversions that occur in nature. What we are currently lacking is a stronger orientation of biochemistry as a natural science towards such materials systems that are of technical interest. This would also open for genetics a broad working and application field. Up to now, genetics has been working on materials for which biochemical advances already exist. But we need a new biochemical advance, so that genetics can expand; even regarding processes for products which can be obtained biosynthetically better than synthetically.

Prof. Krumphanzl: I previously mentioned that we do not have available sufficient raw materials for biotechnological processes. But finally, products such as protein must be fabricated on a large scale in every country. The Soviet Union, for example, cannot undertake to make deliveries of this to all the CEMA countries.

But even in biotechnology there are certain fashionable directions. Suddenly all countries at the same time want to produce insulin or interferon genetically. I mean, for these substances which can be produced on a small scale, specialization is necessary. Few countries could undertake production for all the others. This is my "futurology".

For the future direction of biotechnology, I would look at reactions which have hitherto run chemically, for example with inorganic catalysts. In the future, we will increasingly use microorganisms, such as enzymes from the foodstuff and pharmaceutical industry as biocatalysts in the chemical industry.

Prof. Hollo: Now again to technical biochemistry. For its better researching, we must approach on a metabolic path, to create new plant protection means and medications.

Prof. Panayotov: The most important objective of biotechnology in the next years will consist in decomposing waste products of industry. In addition, new industries must be created which produce without generating wastes.

Kutschmar: What tasks do you derive from the symposium for basic research, and how can our countries cooperate in this?

Prof. Hollo: Please pardon me that I mention problems that seem important to me only as slogans - gene manipulation and protoplast fusion. With both, successful laboratory experiments are not yet being transferred into a small-scale process and not at all into an industrial scale process. In biotechnology, the transfer to a process of proper scale in the small technical operations is much more difficult than in chemistry. For this reason, it is necessary to reinforce interdisciplinary collaboration with biologists. Just as important is machine construction for biotechnology, about which we spoke briefly. Great attention must also be paid to economy. We may not forget about the economy of highly interesting biotechnological processes. In view of these facts, we must state: Our multilateral collaboration could be significantly more close. But wishing alone is not sufficient. It is important to discuss already the goals and not only the results.

Prof. Panayotov: Here in Bratislava, we have clearly recognized that molecular genetics and genetic engineering have not yet reached the necessary status. For

this reason it is among our most urgent tasks that we are capable of better controlling genetic engineering, cellular and molecular technology, and this even means the technology of individual molecules,

Prof. Beker: An important conclusion of this symposium could be: Basic research within a country should be better coordinated and, for example, genetic researches should be more closely connected with research on structures and functions of enzyme conversion.

Among the directions which we should develop jointly one finds bioconversion. Another form of collaboration are joint research programs such as the one that has just been concluded concerning revertase.

Prof. Ringpfeil: For basic research in our discipline, it is increasingly necessary to work out more strongly the natural-science component of the research so that innovations which finally bear fruition in technical processes, are founded less empirically but more scientifically-analytically. At the earliest possible time of the innovation, its economic evaluation is necessary; whoever calls himself a technologist must also think economically.

As regards our collaboration, I would like to join Prof. Krumphanzl's lecture, in which he says that if there is any outside economic pressure - and he clearly addressed the confrontational course of the Reagan administration - Socialist countries have always joined themselves together more closely and have solved their problems. This perspective must also determine our cooperation during the next years.

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ROBOTICS USE IN BLOC COUNTRIES SURVEYED

Bern TECHNISCHE RUNDSCHAU in German No 19, 10 May 83 pp 4-5, 7

[Article by Rolf Lory, press office head, Agifa Trade Fairs, Zuerich: "East Europe Is Betting on Industrial Robots"]

[Text] In recent years there have been repeated indications in the international media that the countries of the RGW (Council for Mutual Economic Aid, the eastern counterpart of the European Economic Community) include in their programs special efforts directed toward increased productivity. In these programs an important role as aids in attaining these goals is played by industrial robots and other handling devices such as manipulators, feeder and transfer devices. Relatively clear ideas in this area have been emerging from the two most important countries of this bloc, namely the GDR and the Soviet Union.

The GDR has high goals. According to the World Bank the GDR is at the moment twelfth among industrial nations. Until 1954 interest was centered on building up basic industries, then until 1963 it aimed at catching up in the renovation of the other domains of the economy. From 1963 to 1970 concentration was upon high technologies and this was followed by a phase of consolidation. Since that time absolute priority has been given to the new technologies, especially microelectronics.

After the starting gun for the further development of microelectronics as early as 1976 at the Fourth Congress of the Central Committee of the SED and after the official resolutions at the Sixth Congress of the Central Committee in 1977, the Government of the GDR presented plans which excited much interest. According to the directive for the 5-year plan from 1981 to 1985 there are to be constructed and used productively 40,000 to 45,000 robots [1]; according to another source [2] the number may even range from 45,000 to 50,000. In the minds of the planners an industrial robot should on the average replace 2.5 workers.

Soviet Union

Western industrialists have probably been surprised by the announcement [3] that authorities of the USSR in the Fiat Automobile Factory in Togliatti have

for the present installed no industrial robots. However, it is known that in accordance with a comprehensive plan it is expected that introduction of industrial robots is being made a reality. Just what the initial number of installed industrial robots may be is hard to say. In the beginning of 1981 official sources are said to have spoken of 6,000. According to a study conducted by the German Federal Office of Foreign Trade Information in Cologne around 7,000 industrial robots were in use, however, as early as the end of 1980. However, their number is to be enormously increased: by the end of 1985 it should be from 40,000 to 45,000 units. Around 80 percent of them shall be used in machine construction and in metal processing; of this number about 40 percent in metal shaping technique, around 25 percent in machining and around 35 percent in foundry operations, heat treating and in workpiece manipulation [4]. According to an estimate made by the Institute for Eastern Market Research in Hamburg the demand should climb by 1985 up to as much as 100,000 units. This large number would, of course, probably also include simple nonprogrammable devices or feeder devices.

In the West there are varying judgments of the inclination of official Soviet offices toward cooperation with Western manufacturers [5-7]. While some expect that domestic developments will be combined simultaneously with imports aimed at closing possible gaps in the plan, others expect Soviet (or at least East Bloc) domestic developments combined with efforts in the direction of autarky. The first group base their views upon the following considerations and observations: the imbalance between the working population and those no longer involved in the work process is increasing. About 40 percent of the workers perform heavy manual work with little productivity. The consequences are amongst others a generally low labor productivity and slow industrial growth. This would probably also have a negative effect upon the development and manufacture of robots. On the other hand the opinion in the second group is that: it appears only natural that the Soviet leadership should give absolute priority to automation making use of manipulators and industrial robots. Brezhnev emphasized on 8 August 1980 at the 26th party congress the necessity for increasing production in the period 1981 to 1985 eightfold as compared with the last 5-year plan. Already in a resolution formulated more than 16 years ago it was asserted that the production of Soviet manipulating devices had finally begun to rise above zero. At the same point in time the Gosplan (State Planning Committee), a group of machine construction ministries and the State Committee for Science and Technology were criticized for incorrectly estimating the importance of this technology for Soviet industry and they were urged to undertake developments in the domains of machine construction, mining, ferrous and nonferrous metallurgy, agriculture, housing, light industry and food industry and transport.

The results existing today are not comparable with what is understood in the West by the term robot technology. It is true that handling systems (mostly simple) have been developed and also the theoretical know-how seems to have been achieved but nevertheless one must assume the Soviet robot technology to be practically still in its early stages.

This may evoke surprise if one considers the number of factories, research institutes and especially ministries which are concerned with manipulatory technology. The important ones among the government offices are:

- a. Ministry for Energy Machine Construction,
- b. Ministry for Heavy and Transport Machine Construction,
- c. Ministry for Machine Tool Construction and Tool Industry,
- d. Ministry for Machine Construction,
- e. Ministry for Equipment Construction, Measurement, Guidance and Control Technique,
- f. Ministry for Engines and Instrumental Machine Construction,
- g. Ministry for Aircraft Construction,
- h. Ministry for the Automobile Industry,
- i. Ministry for Tractor Construction,
- j. Ministry for Ferrous Metallurgy,
- k. Ministry for Nonferrous Metallurgy,
- l. Ministry for Electrotechnology.

But up to now the factories have been producing mainly for their local needs. Only recently have there been plans for special production factories for handling devices the first of which is now being built in a Moscow suburb. Specialists to be employed in this new branch of industry are now being trained. Around 200 types of devices have been developed and of these already one-fourth have been produced--but because of the multiplicity of models presumably this production has not been at low cost.

In order to avoid the negative consequences of decentralization of development and production Professor Yurevich of the Leningrad Polytechnical School has created a special concept: using only 10 pneumatic, 15 electromechanical and 20 hydraulic modules the most important functions of manipulatory devices are carried out. In this way it is claimed that the usable number of pieces can be drastically increased. Even a small factory operation could construct "its" robots out of the various components. This concept offers notable advantages: increased technical level with reduced investment costs; time-saving from development up to the point of production by using module technique and finally also reduced production costs for robots.

Despite such initiatives at home, the "Robot 82" Fair organized in Leningrad in October 1982 showed the interest of the Russians in scientific information exchange and industrial cooperation. And Western manufacturers like to detect such smoke signals! But it is true that American manufacturers at the present time still like to leave such contacts to their non-American licensees. Thus the largest U.S. manufacturer, Unimation, Inc., is attempting to make sales in the USSR and in the other East European countries through the

intermediacy of the Japanese licensee, Kawasaki Heavy Industries, Ltd, and the Finnish licensee, the Nohia Group.

For example, Kawasaki is planning a giant robot factory in the vicinity of Kobe. A fifth of its production is expected to be exported to the RGW countries. Since for political reasons the American concerns are no longer making a direct appearance the sons of Nippon are using their opportunity. The Japanese cover organization, Industrial Robot Association, has already negotiated arrangements for scientific-technical cooperation and has set up professional symposia. There are also attempts to cooperate in the domain of tactile pickups. Fanuk Fujitsu has entered into negotiations regarding the dissemination of know-how in the domain of guidance technology.

The extensive experience of the Japanese would be just what the Soviets need. Also their prices which are substantially below those of comparable European manufacturers make them attractive in Moscow. Since Japan has also signaled its readiness to cooperate with the Soviet Union in the entire domain of automation the involvement of the related ministries and organizations is that much more understandable.

Consistently with their traditional "cleverness" Russia has been and is now open also in the direction of Europe. One hears repeatedly of negotiations with well-known manufacturers: Kuka (FRG), Asea (Sweden), Fiat (Italy) and--unconfirmed--recently also Trallfa (Norway) and Fata (Italy). The Soviets appear--at least up until last year--not yet to have found the way to the British and the French. And also Switzerland because of its (still) slender offering has thus far appeared to be insufficiently interesting.

The example of Fata, Turin, shows that deliveries of industrial robots or of robotized manufacturing centers need not be limited to sample runs only or small contracts only. Already this year a complete welding production line for automobile doors using spot welding Jolly 80 type robots have been delivered at a value of \$9 million [8]. The computer-controlled production line will produce 3,200 automobile doors daily.

#### German Democratic Republic

In the GDR there appears to be less interest in cooperation with Western partners. On the contrary. In conversations at the exhibits in this year's Leipzig Spring Fair who heard repeated references to the fact that the industrial robots IR 10 E (new) and IR 60 E (1981 development) are domestic developments. The emphasis placed upon the fact that the two devices are equipped exclusively with components, accessories and peripheral devices produced in the GDR implies, however, that the other models built in central Germany are at least dependent upon foreign structural components. Possibly the latter have as a result even better export chances into Western countries than the two totally GDR devices which are required by the specifications to demonstrate their readiness for export. It was for this reason that the model IR 60 E (Figure 1) was also subjected to comprehensive fatigue tests, as stated in the press [9] by Dr J. Schniese, the head of the 50-member research and development team. This model IR 60 E was the first model developed by

the VEB Combine "Agricultural Machine Progress," Neustadt in Saxony, with the assistance of the "Competing" Central Engineering Metallurgical Plant (ZIM) and was built in a preliminary series of seven units. Since 1983 the IR 60 E--as also later the IR 10 E (Figure 2)--has been mass produced in the VEB Impulsa Construction Plant in Elsterwerda.

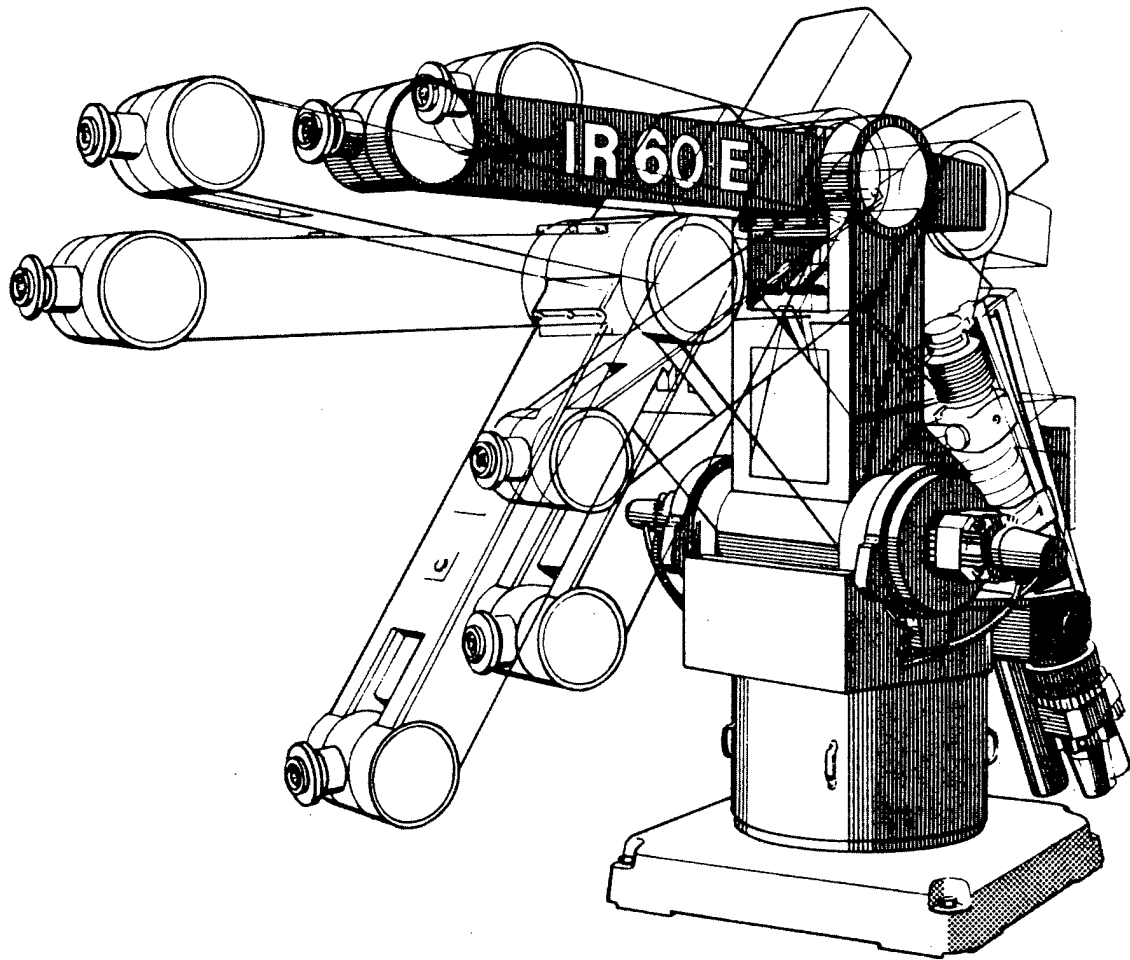


Fig. 1. Articulated robot IR 60 E (manipulating mass 60 kg) (figure: VEB "Progress," Neustadt).

In apparent competition with the devices from Neustadt there are the externally similar but not identical articulated robots ZIM 10 and ZIM 60 of the Central Engineering Metallurgical Plant, Berlin (GDR), and also the same plant's industrial robot UNIZIM 30 constructed out of translation and rotation components.

Rotation/translation robots are also manufactured by the VEB Berlin Machine Tool Factory (Berlin). While the model IR 2/S2 is already proving itself in productive use (Figure 3), the model IR 2/S1 has only recently been developed (Figure 4).

# Industrial Robots in the GDR

Model	Manufacturer	Manipulating Mass, kg	Axial Paths, °					
			C	B	A	D	E	F
Articulated Robot								
1) IR 10 E	VEB Combine "Agricultural Machine Progress," Neustadt	10	±165	±40	+40/ -20	±185	±90	--
2) IR 60 E	VEB Combine "Agricultural Machine Progress," Neustadt	60	±165	+50/ -20	+55/ -10	±185	+75/ -120	--
3) ZIM 10	VEB Central Engineering Metal- lurgical Plant, Berlin (GDR)	10	±165	±40	-20/ +40	±180	±90	--
4) ZIM 60-1	VEB Central Engineering Metal- lurgical Plant, Berlin (GDR)	60	±165	-20/ +55	-10/ +55	±150	+75/ -120	--
Rotation/Translation Robot								
1) IR 2/S2	VEB Berlin Machine Tool Fac- tory, Berlin (GDR)	40	±135	--	--	±135	--	--
2) IR 2/S1	VEB Berlin Machine Tool Fac- tory, Berlin (GDR)	40	±135	--	--	±135	--	--
3) UNIZIM 30	VEB Central Engineering Metal- lurgical Plant, Berlin (GDR)	30	±165	--	--	±150	--	±90
4) IR 5	VEB Engineering Plant for Ra- tionalization, Doebeln	5	±120	--	--	+180	±60	--

At last year's fair one could see another robot which, however, is no longer to be found this year: the rotation/translation robot IR 5 (for a 5-kg manipulation mass) of the VEB Engineering Plant for Rationalization, the scientific center of the Combine "Household Devices," Karl Marx City.

Likewise absent was the articulated robot PSR 01 of the VEB Combine "Locomotive Construction--Electrotechnical Works," Henningsdorf (Figure 5).

Table (continued)

Axial Paths, mm			Reproduction Precision, mm	Drive	Power Consumption, kw	Guidance	
<u>X</u>	<u>Y</u>	<u>Z</u>				<u>Model</u>	<u>Manufacturer</u>
Articulated Robot							
--	--	--	±0.2	Electro-motor	About 3	IRS 650	VEB Automation Facilities Construction, Berlin (GDR)
--	--	--	±0.4	Electro-motor	About 5	IRS 650	VEB Automation Facilities Construction, Berlin (GDR)
--	--	--	±0.2	Electro-motor	About 2	MR	VEB Combine "Wilhelm Pieck," Mansfeld
--	--	--	±0.4	Electro-motor	About 5	MR	VEB Combine "Wilhelm Pieck," Mansfeld
Rotation/Translation Robot							
630	710	50	±1.0	Hydraulic	8	IRS 600	VEB Automation Facilities Construction, Berlin (GDR)
630	630	50 (100)	±1.0	Hydraulic	8	IRS	VEB Automation Facilities Construction, Berlin (GDR)
1,000	750	100	±0.5	Electro-motor, pneumatic	?	CNC	?
600	400	--	±0.4	Hydraulic	?	IRS 600	VEB Automation Facilities Construction, Berlin (GDR)

In Leipzig it was not possible to determine whether the production of these two devices has been stopped. In the case of the PSR 01 because of certain similarities to the ZIM 10 (and ZIM 60) it is not impossible that it served as a pilot product for the latter or in other words that it was their predecessor.

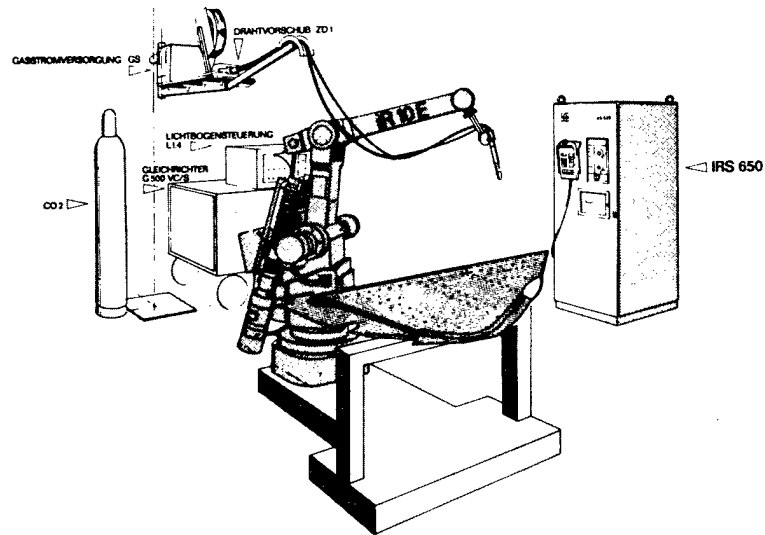


Fig. 2. Articulated robot IR 10 E for MAG [expansion unknown] welding of lateral walls for the cutting blades of a mowing and threshing machine (figure: VEB "Progress," Neustadt).

#### Bulgaria

Because of its frequent presence at the Leipzig fair, the size of its exhibit and the multiplicity of its exhibited manipulation devices (in part exhibited only in the form of large photos) we shall mention next the Bulgarian NPKR (Scientific Production Combine for Robot Technology), Stara Sagora. A recent development of this manufacturer seen this year was a simple pick-and-place device. Of greater interest were the industrial robots of the series RB-1 and RB-2 (Figure 6) which as compared with the previous year's exhibits were capable of more precise positioning or in other words were further developed. These were manufactured under license to the American AMF or developed out of AMF devices. Licensed constructions of the Japanese manufacturer Fanuk were formerly to be seen which have now apparently been further developed into domestic (i.e., Bulgarian) devices.

#### Poland

Up to now nothing by Polish manufacturers has been seen at the fair. Nevertheless various devices are built in that country [10], in part under license to Asea.

The industrial robot RIMP-401 is built on the basis of a "quasi-prefabricated unit technique"; it can be equipped with two different structural components to generate horizontal motion. Since 1976 various industrial robots have been developed in the Institute for Fine Mechanics, IMP, based upon the model RIMP-401--having features which meet various specific industrial requirements. These are:

- a. RIMP-401 WG, a fixed robot with two arms,

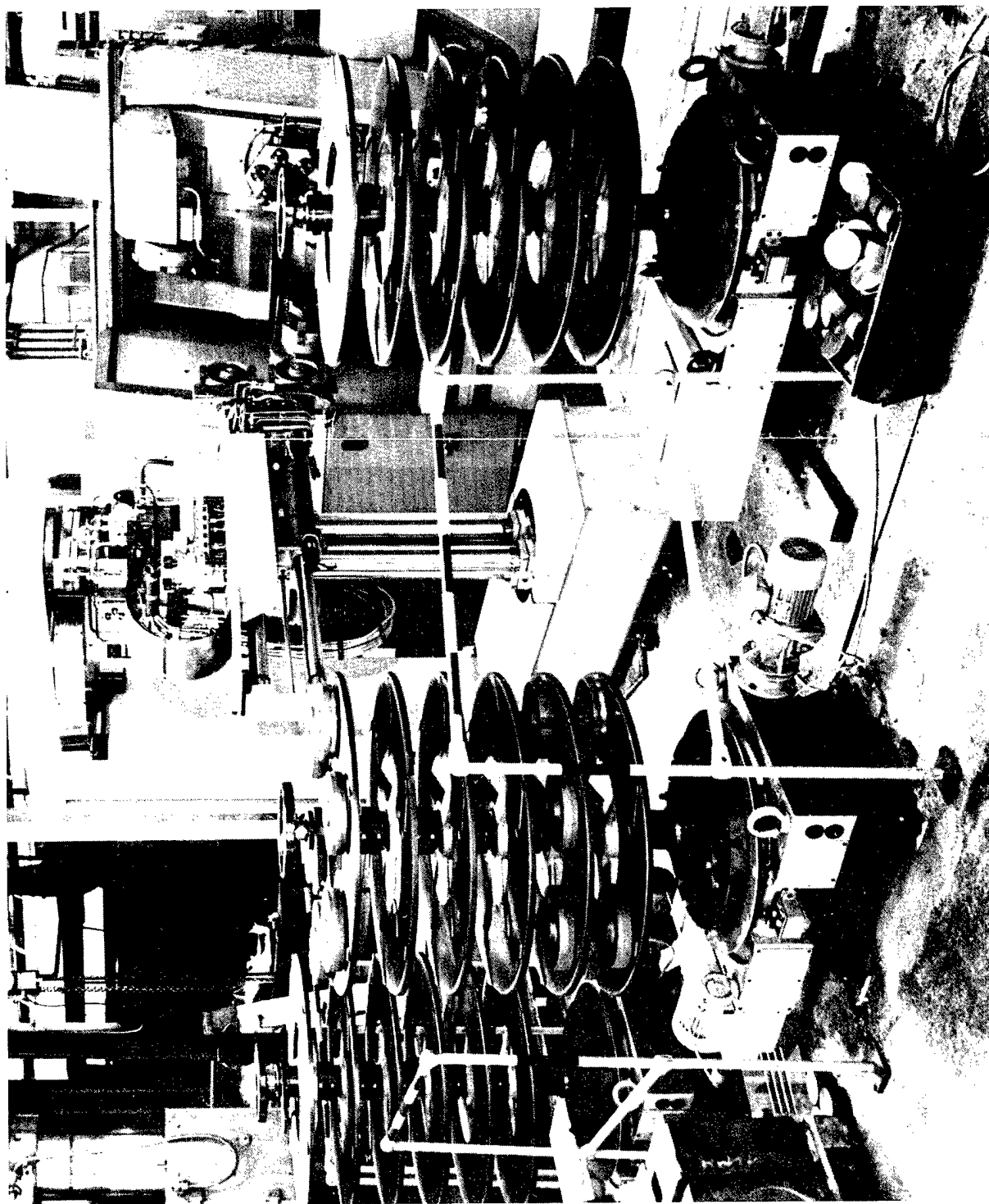


Fig. 3. Rotation/translation robot IR 2/S2 for loading a machine tool (figure: BWF [expansion unknown]).

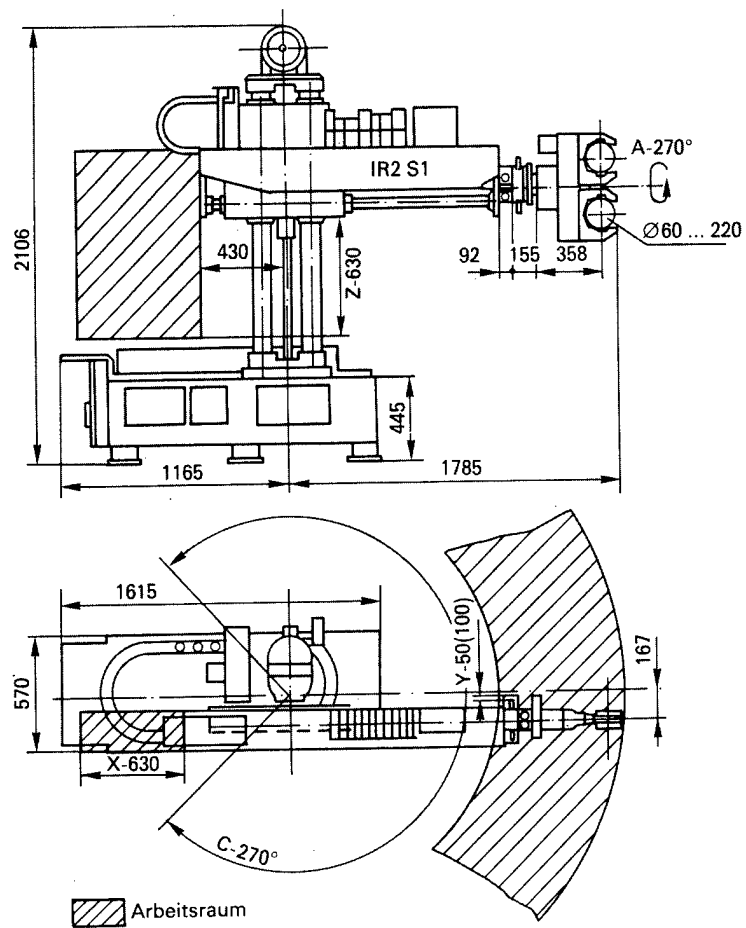


Fig. 4. Rotation/translation robot IR 2/S1 of open-pillar type, with parallel double calipers (figure: BWF).

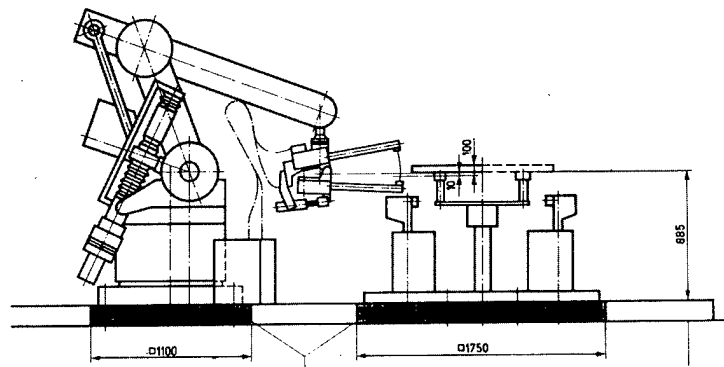


Fig. 5. Articulated robot PSR 01 (figure: LEW [expansion unknown]).

- b. RIMP-401 WT, a robot on a moving undercarriage and having one arm,
- c. RIMP-401 WPD, a robot on undercarriage with two arms,

- d. RIMP-421, a robot designed for carrying power up to 150 N,
- e. RIMP-401 W, a robot for use by injective casting machines for plastics,
- f. RIMP-401 PR, a robot having a structural unit with 2° of freedom (translation relative to a horizontally directed axis and a lifting motion relative to a vertically directed axis).

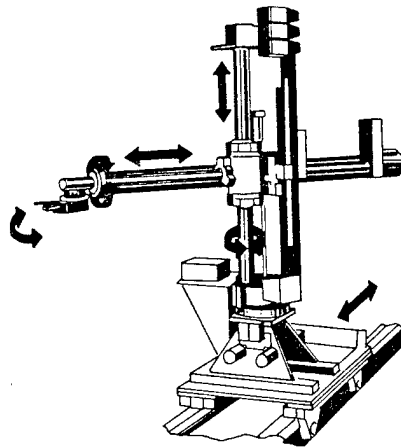


Fig. 6. Industrial robot of the series RB (figure: NPKR [expansion unknown], Stara Sagora, Bulgaria).

All robots have a total of 4° of freedom. Lifting motions and rotating motions are generated pneumatically-hydraulically. Pneumatic drives are associated with the other degrees of freedom (which also serve to generate a horizontally directed motion). The positioning is accomplished relative to two given points; only in the case of the rotational unit is it possible if desired to produce a three-point positioning. The positioning is accomplished with the aid of stops which are associated with hydraulic impact shock absorbers.

The industrial robots PRO 30 and PRO 80 have been developed in the CBKO Center primarily for the purpose of operating conventional and numerically controlled machine tools. They are designed for a carrying power of 300 and 800 N. They are intended basically for the automation of the processing of rotationally symmetric and box-shaped parts. In their standard design they have two gripping calipers. They are suitable for bringing up and for removing workpieces.

As in other RGW countries, in Poland there are a large number of institutions which are concerned with manipulation technology. On the practical side they are:

- a. Institute for Fine Mechanics (IMP),
- b. Industrial Institute for Automation and Measurement Technique (MERA-PIAP),

- c. Research and Construction Center for Machine Tools (CBKO),
- d. F&E Center for Basic Questions of Technology and Design in Machine Construction (OBR TEKOMA),
- e. Plant for Industrial Automation (ZAP),
- f. Plant for Vehicles (WSK PZL).

On the science-research side there are:

- a. Technical Advanced School of Warsaw:
  - i. Institute for Automation Technology,
  - ii. Institute for Mechanical Technology,
  - iii. Institute for Aviation Technology and Applied Mechanics,
- b. Technical Advanced School of Gdansk (Danzig),
- c. Technical Advanced School of Gliwice (Gleiwitz),
  - i. Institute for Automation.

#### The Zurich Scene

The Zurich fairground with its "industrial handling" fairs has established itself as one of the showplaces of robot technology. This is evidently quite specially true in the case of experts from the RGW countries; a large number of [RGW] persons at the Leipzig fair have let it be known in conversation that they have already visited the Zurich technical shows in the past and shall also do so in the future. As their export efforts increase the East European entrepreneurs who have handling devices to offer will spare no effort in competing as exhibitors at Western fairs. That Zurich has a good chance to be the site of such exhibits is a little more than just assumption. But whether it will be possible to see RGW devices at the next industrial handling fair in the beginning of 1984 is something which cannot be said today.

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8008

CSO: 2302/1

LATEST SERVICES, EQUIPMENT OF HUNGARIAN POSTAL SERVICE

Budapest HIRADASTECHNIKA in Hungarian Vol 34 No 2, 1983 pp 90-91

PECZKO, Ivan, Central Telegraph Office of the Post Office

[Article by Ivan Peczeko, Central Telegraph Office of the Post Office.  
Delivered as a lecture at the Seventh Scientific Conference of the Technical  
College of Communications, Telecommunications and Electricity]

[Text] 1. Antecedents.

The Hungarian Post Office has, in the area of telegraph service, the public telegraph network and the telex teletype network.

For a long time only the manually operated and subscribed telephone network was available for data transmission although originally it was not designed for this purpose.

Since the beginning of the past year the data transmission circuit network has also been available for data transmission.

(The Hungarian Post Office also deals with the establishment of public networks with group connected and subscribed lines.)

Among the networks listed the connected telegraph networks (TX, TGX, GX) are fully automated networks, the telex and the GX with international direct dialing. The provincial exchanges are of the lever-selector system types.

In spite of their physical state these exchanges are not up-to-date any more. It was for this reason that the Budapest exchange was replaced by a fully electronic system with stored program control at the beginning of 1981 that also makes possible international hookups.

The use of the manually operated telephone network for data transmission has many disadvantages: high noise level, long connecting time, limited transmission speed, traffic overload. The direct connections are, in general, less economical for the user and in the case of trouble there is no automatic substitution. In both cases it is difficult to provide efficient postal support for the operation because of the many different types of equipment.

To eliminate a substantial part of the difficulties and in agreement with the corresponding CCITT [International Telegraph and Telephone Consultative Committee] recommendations as well as with the concepts of other postal directorates the Hungarian Post Office has established its line-connected network to satisfy the cybernetic needs at a higher level.

From an engineering point of view, it is a single-combined function telegraph and data center, its type being NEDIX-510A.

2. The NEDIX-510A type center of the Hungarian Post Office.

Subscriber services provided by the center.

		5)	6)		12)		
3)	CCITT X. I. oszt.	Adatátvitel		Választás, kapcsol. felép.			
		7) sebesség bit/s	8) kód	13) sebesség bit/s	15) kód	16) ábécé	
1	Távíró	0.	50	7 és 7,5 9)	50	7 és 7,5	No. 2.
	Adat	1. 300 2. 110 2! 200 max. 200	11 elem 11) 11 11) 11 tetszőleges	300 110 200 Sz. t.	11 11 11 Sz. t.	No. 5. No. 5. No. 5. Sz. t.	14)
2	Szinkron	4.	2400	11	2400	11	No. 5.
		5.	4800	11	4800	11	No. 5.
		(6)	9600	11	9600	11	No. 5.

Key:

1. Synchronous
2. Asynchronous
3. Telegraph
4. Data
5. CCITT X. Class I.
6. Data transmission
7. Rate bit per second
8. Code
9. 7 and 7.5
10. Element
11. Optional
12. Selection, circuitry, construction
13. Rate bit per second
14. Synchronous type
15. Code
16. Alphabet

The system is controlled by a stored program, thus its telecommunication characteristics are determined by the data (tables) containing the characteristics of the telecommunication environment used in the operator programs and programs. (Numerical system, services, group formation, etc.)

The storage of the above, the interfacing of the telecommunication lines, the man-machine interrelationship, the execution of switching, the execution of

the auxiliary functions are guaranteed by suitable electronic instruments.

1. Center processing subsystem.
2. File subsystem.
3. Switch subsystem.
4. Terminal subsystem.
5. Manually operated subsystem.
6. Maintenance and operation subsystem.

The equipment used and certain operational characteristics are similar to the solutions used in cybernetics although the function of telecommunication is the decisive factor in system structure.

Several thousand lines that operate at various rates and where several types of methods are used have to be provided.

The required system stability is provided by the following:

- spare parts, production technology, assembling,
- doubling of common units (at two levels),
- continuous automatic control of operation,
- automatic restart in case of error,
- diagnostics,
- extensive warning system,
- off line repair equipment,
- possibilities for automatic testing of the transmission technological network.

These are needed so that the Post Office could provide trouble-free telecommunication services to the users (subscribers).

Subscriber services are as follows:

Teletype:

- call transfer,
- conference connection,
- serial number formation,
- short call,
- message transfer,
- direct call,
- closed circuit subscriber group formation,
- international calls (in the telex network 180 directions; countries).

Data:

- direct call,
- closed circuit groups with various rights,
- serial number formation,
- identification of called and calling lines.

The center establishes the call within 50 to 500 milliseconds. The probability of unsuccessful calls due to center error is less than  $10^{-3}$ .

Currently there is only one electronic center in Budapest but the data network is structurally national because multiplexers are operating in the larger cities.

The network is being updated partly by developing the line network in the stored program control base and partly by introducing the connected and subscriber network services. Since the lack of circuits at the lowest level of the base network is the most frequent obstacle in meeting the data transmission needs the elimination of this obstacle is one of the aims why the subscriber data network service is being introduced. In fulfilling this aim, the Hungarian Post Office intends to rely primarily on the domestic market.

Furthermore, the existing technology (teletype centers) is expanded using modern auxiliary equipment.

#### Literature:

Nippon Electric Co. Ltd.: NEDIX-510A telex and data switching system description.

2228

CSO: 2502/60

## PROGRAMMING CALL-HANDLING FOR SPC TELEPHONE EXCHANGES

Budapest HIRADASTECHNIKA in Hungarian Vol 34 No 1, 1983 pp 27-31

MAKAY, ATTILA, HASENAUER, MIKLOS, REZNAK, and ROXAN, Dr, Beloiannis  
Telecommunications Factory

[Abstract] The article discusses programming of call-handling tasks for SPC [Stored Program Control] telephone exchanges by CPL [Call Processing Language], a high-level programming language developed in BHG [Beloiannis Telecommunications Factory]. The language was intended for use with the PABX EP 512 exchange, a larger member of the EPEX family, but it is also suitable for solving other real-time problems. Language "blocks," or subroutines, are available to implement certain tasks. These are called into action by the command EXEC; three of these are used: GOTO, BRANCH, and CASE, each discussed in detail. The commands NEXT or END complete each stage. In the operative phase the program is broken down into two parts, which have the advantage that when a subprogram is changed, only that portion has to be rewritten and its size is negligible (0.5 K byte in one example). The MAT 512 control equipment is structured by pages which can be individually addressed by the program. Floppy disc is used for the code, and the commands EQU, PAGE, and STOP are accepted. The translator program "reads" the source program three times, checking itself before advancing each stage. The program consists of about 3,200 lines requiring about 10 K bytes; the tabulations need another 14 K bytes. The appendix contains descriptions of the CPL commands. Figures 3, references 4: 2 Hungarian, 1 British, 1 German.

8584

CSO: 2502/60

## COMPUTERIZED DESIGN-PRODUCTION-CONTROL SYSTEM FOR PRINTED CIRCUIT BOARDS AND SUBSYSTEMS IN TELEPHONE FACTORY

Budapest HIRADASTECHNIKA in Hungarian Vol 34 No 1, 1983 pp 32-40

KOVACS, ANTAL, TERTA [Telephone Factory]

[Abstract] Elements of the process have been implemented at varying technological and efficiency levels to suit the enterprise's financial, personnel and available technological opportunities, which are influenced by product structure, construction, development and risk factors, etc. PCB assembly is described in detail, with equipment. Axial and DIL-capsulated elements are used, and due to the 4-5 years required to develop the system it is felt that implementation is worth while only if a useful life span of at least 10-15 years can be expected. Home-developed and built mechanical and manual equipment is used for preparing the axial and radial components as well as transistors, and a home-built semiautomatic machine implants the soldering terminals. Manual or automatic implantation of the components is chosen as a function of the length of production run and quality-reliability considerations. US-made UNIVERSAL equipment (2425/2315, 2585, 60-288, 5288/H, 6787 L-DIP, etc.) is used for several operations and controlled by a PDP 11/04 8k or 11/05 8k computer. Finishing assembly may be done by ROYONIC assembler, a rigid-programmed home-built or card-controlled manual assembler. ZEWA and HOLLIS equipment are used for soldering, and 0.5-2.0 percent error is experienced. PACE and ERSK WK 174 manual stations are used for correction and repairs. Labor savings, quality improvement and flexible production capacity are claimed. Figures 14, Table 1.

8584

CSO: 2502/60

## SUPPORT PROGRAM SYSTEM FOR QA96 AND EP128 EXCHANGE CONFIGURATIONS

Budapest HIRADASTECHNIKA in Hungarian Vol 33 No 12, 1982 pp 560-566

GYORI, ERZSEBET, program mathematician and development engineer, and RET, Mrs ANDRAS, Dr, diplomed electrical engineer and development engineer, Beloiannis Telecommunication Factory (BHG) Development Institute

[Abstract] Configuration is the use of customizing equipment with developed component elements for a specific application; for telephone exchanges it involves a wide range of enterprise activities for sizing up the call volume for the preparation of user's documentation. This program system helps that activity for the QA96 and EP128 exchanges; the latter, fully electronic one, is a refined, further developed version of the former, quasielectronic one: they have basically the same control program systems and provide the same services. The configuration system must meet certain conditions including simplicity. The technical proposal, manufacturing preparation and documentation subsystems (which together are the "design system") are discussed. The exchange consists of 1-4 units, each with 128 points. The services that these are called upon to provide depend on data at the user location. Such field data are entered directly on cards and fed as a program into the system. The design system checks input data for errors and contradictions, then furnishes information on the number of each PCB needed for the units. Location data are programmed onto a 2-K-byte area. The program is processed on a BHG R20 computer in one main phase and three phases, in FORTRAN or IBM-ASSEMBLY language; the time requirement is 1-3 minutes. User documentation is printed in one of seven languages. Tables 5; references: 3 Hungarian.

8584

CSO: 2502/61

## ATS SYSTEM IN TELEPHONE FACTORY

Budapest HIRADASTECHNIKA in Hungarian Vol 33 No 12, 1982 pp 570-571

SCHNURMACHER, TAMAS, diplomed electrical engineer, TERTA (Telephone Factory)  
main department head

[Abstract] Control measurements at all quality-critical points in the manufacturing process enable errors to be corrected immediately rather than be concentrated at the end of the production process; this is easier and costs less in the long run. Six component groups are identified; all areas can be automated. Multilayer circuit boards are also tested. Completed boards are tested in two steps: for assembly faults (implants, soldering) and in functional operating tests. The four groups are digital, (V)LSI, analog and hybrid operating boards. In-circuit testing is independent of this grouping. The measurement technology is automated. The instruments and peripheries are several orders of magnitude slower than the microcomputer controlling them through an IEC-BUS system. Maximum cable length is 20 meters. The microcomputers use mini-floppy discs and a rapid printer. The measurement locations can be connected to a high performance computer. Data multiplexer may be installed if several microcomputer systems are used simultaneously. Table 1.

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CSO: 2502/61

## MICROELECTRONICS UP TO YEAR 2000

Budapest HIRADASTECHNIKA in Hungarian Vol 34 No 5, 1983 pp 193-199  
from a speech given at the Microelectronics '82 Conference, Siofok, 5-7 May 82

SZEP, IVAN, Dr, Technical Physics Research Institute of the Hungarian Academy  
of Sciences

[Abstract] The pace of development in microelectronics has slowed in the past 2 years for economic reasons. The design of circuits containing several hundred thousand elements is so expensive that the economical series size exceeds demand. Progress in design principles and design technology is required to move ahead. The monopoly status of silicon is coming to an end. The 1990s will probably be the age of computer-controlled automatic electronics factories. By the year 2000 optical fiber systems may take over the greater part of the tasks of communication and data transmission. A new generation of integrated optoelectronic elements is now developing. Gallium arsenide MESFET transistors will be the basis for a new generation of microwave amplifiers and oscillators and can be used to produce both digital and analog integrated circuits from which one can produce much faster and more compact computers. There will be a spread of CAD and CAM with the aid of standard elements. It may be possible to produce a general matrix, with ion implantation or laser or electron ray heat treatment, from which VLSI circuits can be produced in computer controlled manufacture. The spread of ultrahigh frequency microelectronics awaits an improvement in quality and reduction in price of single crystal  $A^{III}B^V$  semiconductors. In the future we will not think in terms of Kirchoff networks but rather in terms of electronic functions built into the material, deliberately created on the basis of physical properties. Designers will first check their designs with computer simulations and then design and manufacture integrated functional units with the aid of program packages at their disposal. Figures 4; references 17: 14 U.S., 1 Australian, 2 Hungarian.

8984

CSO: 2502/58

## ELECTRONICS AND ELECTRICAL ENGINEERING

## DYNAMIC DESCRIPTION OF MOS LSI CIRCUIT COMPONENTS

Budapest HIRADASTECHNIKA in Hungarian Vo 34 No 5, 1983 pp 200-207  
manuscript received 2 Feb 83

NEMES, MIHALY, Budapest Technical University, HEI [Institute of Communications and Energy Industry]

[Abstract] Simple manual calculation of the dynamic behavior of complex systems has an advantage over computerized circuit analysis programs such as TRANZ-TRAN and ANAL-20 because the latter provide numeric information only in concrete cases, permit study of only a relatively small part of the circuit at one time and may not be available to outside experts working as consultants. In comparison with SSI circuits it is difficult to get a precise description of the properties of blocks inside an integrated circuit--delay times can vary greatly, especially in gate arrays; the outputs of NAND gates must be studied separately; the effect of each element and their combined effect must be studied; etc. The delay must be studied as the function of two parameters--input signal slope and size of load. A few tables make it possible to follow with simple manual calculation the dynamic behavior of any number of stages connected in cascade. The tables must give the delay time and output signal slope as a function of load and input signal slope. When we know the signal change speed at the output of one stage we can determine the delay and output signal slope of the next stage. The calculations for the graphs given here were done with the aid of the ANAL-20 program. The equivalent input capacitance of a gate can be interpreted in two ways--the concentrated capacitance-causing delay and the capacitance-creating signal slope. Usually the difference between the two is negligible, but in the case of a polysilicon wire separate tables or diagrams must be prepared to describe the parallel connection of the poly wire and the concentrated capacitance. In the example given the propagation time on a polysilicon wire exceeds by a good bit the delay time of the gates even at a length of 1-2 mm. Designers can use the method described to decide where larger current gates should be used and where the length of the lines exceeds the expected value. Solutions for the problems discovered might include insertion of refresh stages, increase in signal slope with regeneration stages, use of imitation line sections, etc. The critical points in layout design include the length of line for the clock signal, the length of line between memories, the timing of the write or erase pulse and the delay relationship between erase input and the controlled output. Figures 28.

## DOMESTIC MANUFACTURE AND USE OF RADIO TELEPHONES, PART II

Budapest HIRADASTECHNIKA in Hungarian Vol 34 No 5, 1983 pp 227-231

MALCSINER, FERENC, BHG [Belioannisz Telecommunications Factory]

[Abstract] The first part of the article described the operation of radio telephones. The Hungarian Post Office now authorizes a maximum of 40 channels in the 27-MHz band, but this will probably be raised to 80 channels in the near future. The 27-MHz band is used primarily for CB traffic. The BRG [Budapest Radio Technology Factory] has manufactured radio telephones for several decades, developing a product family which embraces basic sets, peripheral equipment and other auxiliary equipment needed for complete nets including portable and mobile sets and the units needed for a free channel-seeking system. Only amplitude-modulated hand sets are manufactured for the 27-MHz band. The phase-modulated portable sets operating in the higher frequency bands are suitable for simplex or half duplex operation. An example is the "Manpack" with a range of 5-12 km between a fixed and portable station or 1-5 km between 2 portable stations. The FM 301 mobile station has a range of 20-40 km between a fixed and mobile station or 5-10 km between 2 mobile stations. Even fixed stations require repeater stations, a maximum of three, to extend the range beyond "line of sight." A sequential selective caller could be used to build a national net with a theoretically unlimited number of substations. There are systems which can be used as extensions of normal subscriber telephone lines. A vehicle identification system makes it unnecessary for a caller to identify himself in words. Cable systems are used along gas and oil lines. The dispatcher stations are about 200 km apart; a maximum of 16 unattended duplex radio stations can be buried along the cable between the dispatcher stations for communication with service personnel. A potential user of radio telephone equipment must receive two authorizations from the Hungarian Post Office. First he is assigned a frequency for the net to be established, on the basis of which he can order the equipment. Then he must receive authorization to put the equipment into operation; this precisely defines the conditions of use and the fees to be paid. The factory can hand over transmission-receiving equipment or put it into operation only when shown the radio authorization. Figures 10.

8984

CSO: 2502/58

## SPARE PARTS ASPECTS OF EXPEDIENT TASKS IN DEVELOPMENT OF HUNGARIAN TELECOMMUNICATION AND TELECOMMUNICATIONS INDUSTRY

Budapest HIRADASTECHNIKA in Hungarian Vol 34, No 2, 1983 pp 49-53

BERECZ, FRIGYES, Beloiannis Telecommunications Factory

[Abstract] There are several communication links currently available for institutions and individuals. Their introduction took place at different periods of history and for decades no one thought about their amalgamation into a single system. The revolutionary development of these links of communication was made possible by the introduction of semiconductor technology and digital transmission using economically produced semiconductor equipment. Is it permissible in Hungary to aim at digitalization at a time when not even the basic requirements are met in the field of telecommunications? It is because the Hungarian telecommunications industry is producing mostly for export and primarily for the nonsocialist country markets; thus it improves the country's international balance of payments. Since the products are competing in the markets of the developed industrial countries, the development of the Hungarian industry must be achieved so that it reaches the levels of these highly developed countries. Currently, Hungary occupies the 30th to 35th place among the countries of the world from the point of view of industrial development. The lead of the first 12 to 14 countries is considerable and can be estimated to be between 10 and 15 years. Basically, the reconstruction of the old networks and the partial establishment of new networks will be completed by the mid-21st century. The rate of development will be different in each individual country. Currently, there is no digitalization in radio and television but there are community antennae and associated cable networks. The telephone system has about 1.2 million lines with 100 percent analogues electromechanical exchanges. Full automation should be reached between 1986 and 1995. The level of compatibility with the CEMA requirements must be reached by 1995. At that time the radiotelephone network should be made public with a total of 40,000 to 50,000 subscribers. Products development should be assured by the purchasing of licenses, cooperation within CEMA and domestic research and development. In the 6th Five-Year Plan period the development of this branch of industry is determined in the plan's subprogram. Data transmission is made possible by the use of digital, fully electronic teletype and data centers from Japan. Money transfer must be made fully automated to reduce processing time and manual work to the minimum. The establishment of links between process control equipment should be fully utilized to increase their life span and reduce the cost of operation.

In some factories the automated means of designing have been introduced together with numerically controlled production, testing and measuring automats. The execution of the development program supposes that the most modern available spare parts will be used. A decisive factor in the microelectronic revolution is the integrated circuit, particularly the highly integrated ones. The most important classes of the semiconductors are the catalog circuits and the custom design circuits. The spare part needs of the digital-timesharing switching area include timeshare memories, control or address memories, timeshare exchangers and timeshare switches. In the world the new telephone lines amount to 30 to 35 million per year. Furthermore, 400 million lines need updating. All this indicates that this will be an undertaking of enormous proportion. In Hungary by 1990 a total of 150,000 and by 1995 a total of 350,000 to 400,000 integrated circuit telephone lines will be built a year. Furthermore, 30,000 to 60,000 transmission channels, 50,000 radiotelephone lines and 10,000 telex data transmission lines will be needed. Of the custom designed integrated circuit lines series between 100,000 and 10 millions will be needed in the 1990s. In addition to the monolith circuits hybrid systems will also be used. Some designers believe that equipment development will narrow down to the designing of a single box that will contain the integrated circuit, which is already true in the case of watches and pocket calculators. Passive parts are also needed for development to be used either individually or grouped within a hybrid circuit. The selection available from domestic production or imports from the socialist countries is outdated and expensive; thus the producing plants must be modernized and raised to up-to-date level. Development requires the availability of printed circuits, electromechanical parts, interfaces and data input and output equipment. Production of parts requires special paints and dyes, basic and raw materials, metals, alloys and plastics.

Delivered as a lecture at the Spare Parts Conference held in Kecskemet on 18 October 1982.

CSO: 2502/60

## NEW TREND IN MODERN SEMICONDUCTOR TECHNOLOGY: HIGH POWER FIELD EFFECT TRANSISTOR

Budapest HIRADASTECHNIKA in Hungarian Vol 34 No 2, 1983, pp 54-59

PASZTOR, GYULA, Dr, Research Institute of the Telecommunications Industry

[Abstract] Until very recently it was characteristic of the semiconductor technology that the high voltage power current semiconductors were bipolar in operation while the field effect transistors were gaining ground in the area of field effect, element-rich logical circuits. The appearance of the high power (power current, high voltage) field effect transistors represents a new trend in this field. This was made possible by the development of modern technologies and was also made necessary by the disadvantages of the bipolar transistors. The failure of the transistor depends on the dissipated output. In the case of bipolar transistors failure occurs at a smaller dissipated output when the voltage is high. Hot spot development can destroy the transistor. Another drawback is that it requires relatively high control output and there is always some residual voltage in it. These drawbacks are eliminated by the field effect transistors (FET). They are characterized by relatively small drain breakdown voltage and great channel resistance in operation. This is true for both the barrier layer (JFET) and insulated control electrode (MOSFET) transistors. The HEXFET transistor is a specially shaped DMOS transistor obtaining its name from its hexagonal shape resembling a honey cell. Here, the innermost hexagon's edges give the channel of the transistor element. The source field is the area of the innermost hexagon. Figures 13, references 11: all Western.

2228

CSO: 2502/60

## PRIMARY MULTIPLEX SYSTEM TYPE BD-30

Budapest HIRADASTECHNIKA in Hungarian Vol 33 No 12, 1982 pp 553-559

BAKOS, GYULA, TERTA [Telephone Factory] department head

[Abstract] Some of the main characteristics of the type BD-30 new primary PCM system are: modular construction, which assures great flexibility for the user; independent power supply units; unified alarm system; reliability; small size; low power consumption; and full compliance with the CCITT [International Telegraph and Telephone Consultative Committee] Yellow Book's recommendations. Voice frequency terminals made for the Telephone Factory's FDM equipment can also be connected to the BD-30 system. The system's components are described in detail: CMB-30 primary PCM muldex equipment, regenerative line repeaters, three types of signal muldex equipment and service modules. The system provides the following services: alarm systems (urgent maintenance, nonurgent maintenance, service failure), and alarm indication signal, fault isolation (by secondary optical signals and loop operation capability). It also makes maintenance measurements. The latter requires only easily obtainable additional equipment such as an oscilloscope. Construction of the system allowed it simply to be plugged in on either the frame or the user's side. Figures 7, table 1.

8584

CSO: 2502/61

## RADIO COMMUNICATION BEYOND 10 GHZ

Budapest HIRADASTECHNIKA in Hungarian Vol 33 No 11, 1982 pp 481-485 manuscript received 3 Mar 82

BERCELI, TIBOR, Dr, and FRIGYES, ISTVAN, Dr, TKI [Telecommunications Research Institute]

[Abstract] The filling of the frequencies below 10 GHz makes it necessary to use frequencies above 10 GHz despite the wave propagation and engineering facilities. Radio relay stations must be closer together above 10 GHz, with stations only 8-10 km apart at 18 GHz. Digital transmission permits regeneration at each relay and is suitable for telephone, television, data and facsimile signal transmission. The significance of rural networks is increasing, primarily in developing countries. Satellite communications are developing rapidly, using packet switching and multi-access with time sharing. There is vigorous development worldwide in the interest of broadcasting with synchronous artificial satellites. Another area in which frequencies above 10 GHz are used is radio distance measurement, for example in cartography and water and air transportation and for security movement sensing devices. Very broad frequency ranges can be used for energy transmission also. Hungarian development in frequencies above 10 GHz began several years ago in the Telecommunications Research Institute. In the second half of the 1970s TKI prepared a number of circuits for the Postal Experimental Institute for propagation measurements in the 12, 13 and 18 GHz bands. TKI prepared a 12-GHz receiver at the end of the 1970s with which one can receive signals of the OTS-2 satellite. At the beginning of the 1980s TKI developed a 13-GHz digital radio device with a transmission speed of 34 M bits per second. TKI is now working on a 12-GHz receiver suitable for simultaneous reception of 5 TV channels for the Signal Technology Enterprise. This can be used to receive the planned satellite broadcasts for a cable distribution network. Further development at TKI deals with new circuit solutions and even higher frequency ranges. References, 7: all English-language international conference reports.

8984

CSO: 2502/62

## NECESSITY OF, CONDITIONS FOR CONTINUOUS MODERNIZING OF STORED PROGRAM CONTROL EXCHANGES

Budapest HIRADASTECHNIKA in Hungarian Vol 33 No 11, 1982 pp 505-507

PAT, LAJOS, Beloiannis Telecommunications Factory (BHG)

[Abstract] BHG began development of stored program control (SPC) exchanges as part of an international cooperation project, giving birth to the QA exchange family and EP exchanges. The EP exchanges are built of various, well-defined modules, each carrying out one function. This modular construction applies to hardware, software and design. A 512 terminal block provides the basis for the EP exchanges, each block having independent control and containing all the functional units from which an exchange is built. The EP 512 exchange makes possible the connecting of a maximum of 15 such blocks. The EP 128 exchange is built up of four 128 terminal units. The chief functional units of the EP exchanges are the QAK, the telephone exchange in the traditional sense; the QAP, for external peripherals connected directly to the exchange; and the QAT, a power, switching and alarm system. The QAK unit contains a CSK switching unit made up of CSE modules through which the EP exchanges can cooperate with other systems. The modular construction of the equipment has an effect on technological processes and change in technological processes has an effect on the equipment, or the development of the component modules. The static view which developed in past decades must change into a dynamic view. Constant change must be regarded as permanent in the future. The spread of stored program control technology involves constant modernization of equipment. Figures 9.

8984

CSO: 2502/62

## TYPE BO-3-E2 3-CHANNEL CARRIER FREQUENCY SYSTEM FOR OPEN WIRE LINKS

Budapest HIRADASTECHNIKA in Hungarian Vol 33 No 11, 1982 pp 508-515

FUZY, VILMOS, TERTA [Telephone Factory]

[Abstract] The efforts of the postal directorates to develop regional networks prompted the Telephone Factory to develop a third-generation product family with a small number of channels based on uniform systems technology principles. The newest member of this family is the BO-3-E2 system which can transmit three speech channels and four voice frequency telegraph channels over overhead lines. The BO-3-E2 system for remote, thinly populated areas can be connected into the national net and can be operated with the BO-12-E2 12-channel system of the Telephone Factory via a 1-line pair. The system can be powered from the alternating current net or by battery. In tropical countries it could be run on solar power. The complete terminal station has a KMB-3 combined modem panel, a VIB-3 filter panel and a UTB-4 universal telegraph panel. The KMB-3 contains the circuits necessary for amplification, compensation and decomposition (3.18-16.11 kHz in the A-B direction and 18-31.11 kHz in the B-A direction). The VIB-3 separates the line frequency bands for transmission and reception. The UTB-4 contains four 50-Bd (or two 100-Bd or one 200-Bd) frequency-modulated, voice frequency telegraph channels. The LFK-3M supervisory middle amplifier doubles the distance which can be bridged. Built-in testing equipment facilitates maintenance. A BV-3/12 protector offers protection against excessive voltage. The distance from terminal station to terminal station can be as much as 1,020 m with two middle amplifiers. It can operate at environmental temperatures between plus 5 and plus 45°C with a maximum humidity of 80 percent at plus 25°C. The external dimensions are 710 by 600 by 235 mm. Figures 8.

8984

CSO: 2502/62

## EXAMINATION OF ELECTROCHEMICAL MIGRATION IN INTEGRATED THICK-FILM CIRCUITS

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian Vol 22 No 2, Feb 1983  
pp 42-46

RIPKA, GABOR, Dr, adjunct, Budapest Technological University Department of Electronic Technology, and HARSANYI, GABOR, electrical engineer, Micro-electronics Enterprise.

[Abstract] Electrochemical migration of silver, tin, lead, copper and even gold may cause short circuits and failure of thick hybrid integrated circuits. Reliability gets worse when conductors are 0.2 mm or closer to one another. Migration begins when a continuous film of water is present between conductors. Cations go into solution at the surface acting as an anode and deposit on the cathode. Peaks, dendrites form and water may dissociate, forming additional conditions of peak tension and lowered pH. The process accelerates until failure occurs. The water drop test and the thermal humidity bias test are used to determine likelihood and extent of migration. Tests were performed on aluminum oxide ceramic carriers imprinted with emulsions and cured. Scanning electron micrographs, backscatter electron photos, X-ray photos and profiles were studied. Silver migrated even from Pd-Ag and Pt-Ag combinations but not from Pd-Pt-Ag paste. Tin and lead migration is a particularly serious problem where soldered terminals are used. Even gold migrates as a complex if Cl is present in the moist medium, by a mechanism similar to that of aqua regia. And Cl is present in the air especially near the ocean, in trichloroethylene used for cleaning, etc. Thus protection is needed for all conductors used in integrated circuits. The Pd-Pt-Ag system seems even better than gold; it is not known why. Another protection is to keep moisture out. Hermetic casings are prohibitively costly. Research is in progress on crystalline glass layers, lacquers, epoxi and silicone coatings that can be cured below 120°C to protect the solder. Thorough cleaning before coating is essential lest impurities and moisture be sealed in where they can do harm. High-purity multilayer silicone-epoxi coatings will probably be the most feasible economically and technologically. Figures 10, references 7: all English.

8584

CSO: 2502/65

## VACUUM EVAPORATION

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian Vol 22 No 1, Jan 83 pp 1-13

GLASSER, PETER, certified chemical engineer, Microelectronics Enterprise, MOS [Metal Oxide Semiconductor] Division

[Abstract] A discussion of the theoretical aspects of vacuum evaporation includes pressure and rate of evaporation and puts special emphasis on the evaporation of alloys and the spatial distribution of the vapors. The various sources of evaporation are grouped into sources heated by resistance, induction and laser and electronic radiation. Another grouping according to their mechanical construction discusses spiral-, boat- and crucible-type and hard-structure sources. Feeding of the material can be intermittent or continuous. A discussion of substrate holders follows, grouped according to their mechanical construction, the type of drive (external, internal) used and the mode of their heating. A section on monitors discusses the methods used to measure substrate temperature and the rate of film formation. A few special evaporation methods are also mentioned. Finally, a brief mention is made of the qualitative and quantitative goals of further development. Figures 11; references 5: 2 Hungarian, 3 English.

2473

CSO: 2502/67

## VAPOR DEPOSITION, LOW-PRESSURE CHEMICAL VAPOR DEPOSITION (LPCVD)

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian Vol 22 No 1, Jan 83 pp 14-23

SZENDRO, ISTVAN and PUSKAS, LASZLO, United Incandescent Lamp and Electrical Company (EIVRT)

[Abstract] The article is an excerpt from a lecture delivered at the Seminar on Thin Film Vacuum Technology in 1978. An experienced LPCVD installation was built at EIVRT in 1978 for the economical production of silicium nitride thin films needed in the surface passivation of semiconductor materials. The method is now used in production including the production of light sources. The use of the high-temperature LPCVD method in the production of semiconductor films is discussed. Theoretical considerations are followed by a list of the disadvantages of CVD and the advantages of LPCVD. The effect of technological parameters (temperature, pressure, gas flow, wafer diameter and wafer spacing) on the uniformity of the layer and its growth rate is graphically illustrated. The theoretical and actual structure of LPCVD installations is described in detail and some direct experiences are reported. Figures 17; references 19: 3 Hungarian, 16 English.

2473

CSO: 2502/67

## AMORPHOUS SILICON SOLAR CELLS

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian Vol 22 No 1, Jan 83 pp 24-28

LOCSEI, BALAZS, Research Institute of the Electrical Industry

[Abstract] Because it can be prepared at lower energy costs and has a much higher absorption factor, amorphous silicon would be more desirable than single crystals in solar cells. Hydrogenated amorphous silicon thin films would be one of the desirable materials for this purpose. The structure of amorphous silicon is described briefly, followed by a description of the technologies currently available to prepare amorphous silicon thin films. The structure of various types of solar cells built from them is described and illustrated. Figures 12; references 18; all English.

2473

CSO: 2502/67

## CATHODE SPUTTERING, PART I

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian Vol 22 No 1, Jan 83  
pp 29-32

PETO, GABOR, candidate, Hungarian Academy of Sciences, Central Research  
Institute of Physics

[Abstract] Cathode sputtering is one of the principal methods of thin film technology. It is developing rapidly and is replacing evaporation in many areas. It involves thin-layer deposition brought about by ion bombardment. The process can lend special properties to the film, predetermining certain properties of the film. It is a combination of material emission in response to ion bombardment, an ion source and the deposition of the material in a layer parallel to the bombardment. The processes taking place at the target and the ion sources are discussed in some detail. Design of the equipment is accompanied by some new problems. The method replaces the evaporation method as applied to microcircuitry but evaporation is still favored in procedures requiring extreme purity. Figures 7.

2473

CSO: 2502/67

## PNEUMATICALLY OPERATED ACTIVE VIBRATION DAMPING SYSTEM FOR OPTICAL MEASURING EQUIPMENT OF INTERFEROMETRIC PRECISION

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian Vol 21 No 9, 1982 pp 265-268

KAPOSVARI, ZOLTAN, Dr, university docent, BME [Technical University of Budapest] Department of Precision Mechanics and Optics, SZEP, ENDRE, Dr, technical-economic adviser, OLAJTERV [Petroleum and Gas Industry Designing Enterprise]

[Abstract] In the production technology of microelectronics frequently holographic methods are being used. Preservation of measurements, location and form is a prerequisite in holography. Since the quantitative requirements were not available for the damping of the vibration damping system, the amplitude-frequency sequence published in foreign literature was being used. The holographic equipment inevitably is exposed to mechanical effects that make the equipment unusable without proper damping. The disturbing effects can result from within the optical system and from environmental generation. The motoric movement of the individual units of the optical system can be the source of internal generation. Effects through the foundation must be taken into consideration as outside factors. Practical experience indicates that the holographic equipment, in general the optical measuring instruments of great precision, cannot be used without vibration dampers. In making the damper parts and materials were used. The series consisting of several thousand measurements indicates that this equipment is suitable for replacing imported ones, Figures 9; references 4: 3 Hungarians, 1 Western.

2228

CSO: 2502/70

SOME MATHEMATICAL METHODS FOR VEHICLE BODY DESIGNING BY COMPUTER

Budapest FINOMMECHANIKA, NIKROTECHNIKA in Hungarian Vol 21 No 9, 1982 pp 280-282

UJ, JOZSEF, assistant, CSER, LASZLO, Dr, chief scientific staff member,  
Technical University of Budapest

[Abstract] During the geometric designing of vehicle body surfaces great precision requirements must be met. At the same time the designed surface must be sufficiently smooth. The numerical surface descriptive methods known are usually suitable for this purpose. In the method developed by Coons a surface is sufficiently defined by four edge curves. The essence of both the Coons and the Bezier methods is the development of reference points. The methods described herein use the transformation computations. The methods described have been prepared for the IKARUS Body and Vehicle Factory on a CIL-drum drafting computer of the Precision Mechanical and Optical Department of the Technical University of Budapest. Figures 6; references 2: 2 Western.

2228

CSO: 2502/70

## LASER INTERFEROMETER MEASURING OF SILICON WAFER DEFORMATION

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian, Vol 21 No 8, Aug 82 pp 225-229; parts of the publication were delivered personally in a lecture at the international conference of "Microelectronics 81" held in Botevgrad, Bulgaria

KOCSANYI, LASZLO, JAROSZ, MARIUSZ, GIBER, JANOS, Technical University of Budapest, Institute of Physics, Department of Nuclear Physics

[Abstract] Knowledge of the mechanical processes occurring in laminar structure is very important from the point of view of silicon wafer printed circuits. Mechanical stresses develop in the laminar structures during the technological processes that can deform the wafer. This deformation at the current degree of integration and large diameter wafer technology causes problems during the execution of the photolithographic process. For this reason it is worthwhile to study which steps are causing deformation and which one is causing the greatest curvature of the wafer. The deformation measuring methods are all optical. These methods are very precise and can be automated by using a microprocessor. The currently available most modern flatness testers make possible the testing of 80 to 120 wafers per hour. In the Michelson interferometer a dividing mirror is being used to establish any possible deformation in the wafer. In the Moire topography the wafer is illuminated through the optical raster placed before it. On the vacuum table the peak to valley flatness amounted to an average of 7 micrometers and it was observed that flatness could not be increased to less than this value by applying greater vacuum. References: 8: 1 Hungarian, 1 German, 6 Western. Figures 10, Table 1.

2228

CSO: 2502/71

## MICROPROCESSOR SYSTEM FOR INDUSTRIAL APPLICATION

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian, Vol 21 No 8, Aug 82  
pp 230-234

HORVATH, GABOR, SELENYI, ENDRE, Dr, SZTIPANOVITS, JANOS, BME [Technical University of Budapest] Department of Instrument and Measurement Technology

[Abstract] The appearance of microprocessors and their application in industry created opportunity to increase the output of various instruments, tools and machinery and to ease their operation. Practical experience indicates that their use for industrial purposes requires the thorough knowledge of the production technological processes and steps. The MMT [Instrument and Measurement Technology Department] consists of hardware and software elements and it is for designing, production and control. Taking into consideration the technical requirements, the hardware system is a hierarchically standardized system using several cards in which the technology-dependent and technology-independent parts are at various levels. The STANDARD application currently has about 50 various functional moduls. The hierarchical standardization provided the basis for the software elements. The basic level contains system programs for greater usage, system programs for special purpose libraries. In examining the background provided by the system the developmental, production and control background must be taken into consideration. The system can be developed in the area of cards and equipment. In the MMT system a so-called development document is being made of the system element card that contains the data needed for equipment development. The MMT microprocessor system was developed primarily for the MEDICOR [Medical X-Ray Equipment] Works and the first applications were also developed there. So far more than 30 products have been made mostly for medical purposes, some of them already in serial production. Floppy discs are being used for the user's programs and storing of large volume of data. References 5: 3 Hungarian, 2 Hungarian-English. Figures 4.

2228

CSO: 2502/71

## PRODUCTION TECHNOLOGY OF TEFLON DIELECTRIC INTEGRATED MICROWAVE CIRCUITS

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian, Vol 21 No 7, Jul 82 pp 203-208

ACZEL, JUDIT, VERTESY, MIKLOS, Telecommunications Research Institute

[Abstract] The Telecommunications Research Institute has developed the production technology of teflon dielectric integrated circuits, coated with copper and reinforced with fibreglas for the third generation of microwave equipment. Such products are the RT DUROID 5870 and 5880. Among the advantageous characteristics of the teflon dielectric microwave circuits are the relatively low-cost, simple and fast production technology and good mechanical processing qualities. Compared to the thin film ceramics circuits their disadvantage is the smaller dielectric constant that requires a thicker layer of the circuits. In the case of DUROID circuits fine lines and gap size cannot be achieved. This technology can only be used for conducting lines. The resistors have to be installed into the circuitry together with the other parts as a hybrid subassembly. Differences due to etching must be taken into consideration in determining the geometric measurements in designing the DUROID-based circuits. The geometric measurements can be held within a precision of plus minus 25 micrometers yielding suitable electric characteristics in the 10 GHz frequency range. In past years several hundred DUROID-based microwave circuits have been produced, including microwave amplifiers, frequency multipliers and dividers, couplings and hybrids. Figures 5; references 11: 3 Hungarian, 8 Western.

2228

CSO: 2502/72

## LOW COST RESIN-BASED THICK FILM MATERIALS

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian, Vol 21 No 7, Jul 82 pp 212-221. Delivered as a lecture at the conference of the International Society for Hybrid Microelectronics held in Chicago in October 1981.

KELLY, J.M., HUANG, C. Y. D., STEIN, S. J., Electro-Science Laboratories, Inc., Pennsauken, New Jersey, U.S.A.

[Abstract] There is ever-increasing interest in polymer thick film materials that can be applied at low temperatures. These make possible the production of flexible carriers for circuit elements. This paper discusses film materials that can be applied at temperatures less than 150 degrees centigrade. To study the migration of silver between the anode and the cathode a 2-millimeter gap was left and it was covered with ion-free water drop and a 10-volt direct current voltage was applied. Conductive films were studied containing 70 and 45 percent silver used in condenser armor and printed circuits. Cheap printed resistors, flexible wirings and pressure sensitive switches can be made with silver pastes. Very little success has been achieved in making humidity resistant dielectrics but their stability has been increased with longer heat treatment periods. During storage the resistors absorb humidity and thus lower their stability. Low temperature, heat treated products are to be used in toys, television games and other instruments that can operate at high humidity levels. Figures 20; references 5: 5 English.

2228

CSO: 2502/72

## NEW TYPE OF MINIATURE, IMPULSE-OPERATED, SOLID STATE LASER WITH HIGH PEAK OUTPUT

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian, Vol 21 No 4 Apr 82  
pp 114-118

CSERY, HUBA, electrotechnician, SCHMIDT, GYORGY, technician, TOTH, CSABA,  
university student, Lorand Eotvos University of Sciences

[Abstract] One of the main trends in developing the solid-state lasers is to increase its output. This can be achieved by huge-size equipment at high costs. These are characterized by a weight of several hundred kilograms, a size of several meters, high voltage supply units and 5 to 10 kilo-Joule power consumptions. Another trend in development is to reduce the size for better application. For this purpose a new type of equipment was developed with smaller size and high output. The making of the so-called mini-laser was made possible by solid-state laser materials of better parameters and by application of integrated circuitry. The impulse laser was made of parts easily available in Hungary. Thus the mass could be reduced to less than a kilogram and its size could be limited to several centimeters. This mini-laser operates at the infrared wavelength of 1.04 micrometers. The active material of it is Nd-ion polluted phosphate glass. The minimum achievable threshold energy is 0.7 Joule in normal operation that is 0.3 Joule when cut back and at 10 Joule, Q-connected operation mode. Laser shot sequence frequency is 5 Herz in normal mode of operation and 0.2 Herz Q-mode operation. Applications of the mini-laser are unlimited. With further development it can be used in many areas of medicine and microtechnology. Because of its picosecond high peak output it can be used for the studying of ultrafast phenomena. Awarded the Special Youth Prize at the Magazine Article Competition 1981 of FINOMMECHANIKA-MIKROTECHNIKA. References 2: 1 Russian, 1 English. Figures 7, Table 1.

2228

CSO: 2502/73

ADMAP-4 EQUIPMENT TO MAKE PRINTED CIRCUIT CARDS

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian Vol 21 No 3, Mar 82  
pp 72-73

KRIZSANITS, JANOS, developmental electrical engineer, FOK-GYEM [Precision Mechanics and Electronics Instrument Manufacturing Cooperative]

[Abstract] The production of printed circuit cards gains ever increasing importance with the spread of microelectronics. The production of these cards raises many problems. Some of them are technological, some of them are design problems. Depending on the use of production technology the preparation of the master cards may take weeks and months. The ADMAP-4 equipment was developed to facilitate the master card or film production for mass production. Its main elements are: work pad; drafting, drilling and photo heads; and electronic terminals. It can be operated manually or with control tape and data tape. No references. Figures, 7.

2228

CSO: 2502/74

SYMBOL PROJECTOR FOR ADMAP MACHINES

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian Vol 21 No 3, Mar 83  
pp 74-76

FORGACS, BELA, mechanical engineering, SZABO, ZSOLT, scientific department  
head, Central Physical Research Institute of the Hungarian Academy of Sciences

[Abstract] Nowadays the drafting of master films of printed circuits is done by drafting machines by using projected light beams. The equipment producing the projection light beam is a special photo head that projects the image of the various shapes, such as a circle, quadrangle, letter, number, symbol, onto the photofilm placed on the drafting desk. The SYPRO (symbol projector) equipment was developed for the ADMAP-type equipment but is also suitable for application with the digital drafting machine.

2228

CSO: 2502/74

TESTING OF HIGHLY COMPLICATED INTEGRATED CIRCUITS WITH MICROPROCESSOR

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian Vol 21 No 3, Mar 83  
pp 81-84

BANLAKI, PAL, scientific assistant, BME [Technical University of Budapest]  
Department of Electronic Technology

[Abstract] With the increased use of highly complicated integrated circuits there is a demand for methods and equipment to be used for their quality control. There are two methods for testing. One is based on the testing of the parts prior to their installations. The second one deals with the testing of the finished product. In the latter the place of fault must be identified and the bad part must be replaced. The testing methods can be evaluated from many points of view and their important characteristic is their speed of operation. The LEAD (learn, execute and diagnose) technique takes care of the automatic testing of integrated circuits. The core of the system consists of a memory to store the testing program. The 8080A central unit can be used for highly complicated digital circuits by integrating simple interface technology. Figures 5; references 5: all Western.

2228

CSO: 2502/74

## EFFECT OF HEATING ON THIN RESISTIVE FILMS

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian, Vol 21 No 4, Apr 82, pp 108-113

ILLYEFALVI-VITEZ, ZSOLT, Dr, BMT [Technical University of Budapest] Department of Electronics Technology

[Abstract] The characteristics of thin resistive films used in microelectronics change under the influence of heating. Structural rearrangement, chemical transformation, diffuse processes or change of state may cause the changes in function with the intensity and period of time of the heat effect. The process of heating in technology is called heat treatment when change of state does not occur. Heat treatment is usually performed in an electrically heated oven where the entire film and its carrier are heated to the temperature that causes the change in characteristics. It is frequently needed in hybrid integrated circuits that not the entire film but only a part of it be modified such as in the case of a resistor. This can be achieved by local heat treatment but in this case the method of heat application is also different. In this instance a method is being used that releases the heat directly in the film. Such a method is the heating with laser beam or the Joule-heat. These methods heat the film locally to over its melting point and the carrier does not suffer any damage and does not melt. The film material that was melted locally contracts into drops and moves towards the cooler areas and thus forms film-free insulated surface. Insulation cuts can be made by the continuous removal of the film as a result of which the current path of the resistor can be changed and with it its value is also altered. The warming up of thin films through direct heating can be described in a model reflecting the many factors involved. In certain cases when the temperature rises to several hundred degrees Celsius, diffusion into the carrier occurs. Awarded the Third Prize at the Magazine Article Competition of 1981 of the FINOMMECHANIKA-MIKROTECHNIKA. References 11: 2 Hungarian, 1 Hungarian-German, 1 Russian, 2 British, 1 English-German, 4 U.S.

2228

CSO: 2502/73

## PRINTED WIRE CIRCUITS MADE ON METAL CORE BOARDS

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian Vol 21 No 3, Mar 82  
pp 85-93

SZALAY, MIKLOS, Dr, technical economic adviser, Central Physical Research  
Institute

[Abstract] The metal core boards are usually made of copper-coated insulated boards with printed circuits and it is expected that this technology will prevail for the coming decade. Steel, aluminum and alloys may also be used as metal cores when the surrounding temperature is higher than usual. For insulation porcelain and epoxy resin can be used. When porcelain is being used all bores must be made prior to coating. The epoxy resin coated boards were developed by Western Electric and they have a maximum operating temperature of 120 degrees centigrade, much lower than that of the porcelain coated boards but they are less expensive to produce. All drilling and bending operations must be performed prior to coating. The powdered epoxy resin is applied either by electrostatic spraying or by fluid-bed dipping. The H. Kolbe Company introduced the multiwire technology in Europe. The insulation is so good that cross-wiring is made possible. Figures 13; references 15: 3 Hungarian, 12 Western.

2228

CSO: 2502/74

## PRODUCTION OF INTEGRATED SEMICONDUCTOR GAS SENSOR

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian Vol 22. No 2, Feb 1983  
pp 33-41

KOVACS, BALAZS, Dr, diplomed electrical engineer, Applied Physics Research  
Institute of the Hungarian Academy of Sciences

[Abstract] There is great interest in the detection and accurate measurement of various gases and compounds in the air (partial pressure) and water (ion concentration). Applications are in industry, mine air quality, environmental protection, automobile exhausts, medical diagnostics and many other areas of everyday life. The device described is useful in measuring low concentrations of  $H_2$ ,  $CO$ ,  $H_2S$ , etc. Research was done at the Budapest Technological University Department of Electronic Devices. Ion sensitive field effect transistors (ISFET) are used for measurements in electrolytes. These are derived from MOS transistors. Their surface characteristics fall between the two extreme cases of blocked and unblocked interface mechanisms. The Nernst equation describes the electrical potential caused by charge distribution due to ion exchange. Devices for measuring gas concentration use MOS structures coated with palladium, platinum or nickle layers. The device's electrical parameters vary with the quantity it has adsorbed.

The Pd-SiO<sub>2</sub>-Si system is used with  $CO$ ,  $H_2$  and gases from whose molecules it can adsorb hydrogen; for example  $NH_3$ ,  $H_2S$ , ethanol. Measurement is based on gate potential caused by the hydrogen layer dissolved by Pd. The  $CO$  mechanism is different. A series of masks is used to minimize shifts in gate potential caused by prolonged use at high temperature. Inert gas is used to flush the system. Hydrogen adsorption is described by the Langmuir model.  $CO$  concentrations from 100 ppm to 10 percent were measured.

The device's sensitivity is the same as experimental foreign models known from the literature. Figures 15; tables 2; references 23: 21 English, 1 German, 1 Hungarian.

8584

CSO: 2502/65

TECHNOLOGICAL PROBLEMS IN MANUFACTURING OF  $\text{TeO}_2$  ACOUSTO-OPTICAL MODULATORS

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian Vol 22 No 2, Feb 1983  
pp 47-50

JAKAB, LASZLO, BEHRINGER, TIBOR, and KOCSANYI, LASZLO, Budapest Technological University, Institute of Physics, Nuclear Physics Department

[Abstract] The article reports on short production runs of  $\text{TeO}_2$  modulators from domestic materials. The finished devices are widely useful in computer, communication and measurement technologies as well as other areas and are exportable.  $\text{TeO}_2$  castings (made in Hungarian Academy of Sciences facilities) must be cut to a precision of  $10^{-4}$ ; a modified Laue X-ray diffractometer is used for orientation. Aluminum is vapor-deposited on the precision-polished and preheated crystal as a transformer layer for the 45-micrometer-thin  $\text{LiNbO}_3$  sheet which serves as the Piezo electric ultrasound generator. This must be ground down to thickness from 0.8-mm slabs. LOCTITE cyanacrylate glue is used to attach the  $\text{LiNbO}_3$  sheet; bonding is achieved quickly and easily but it still generates some heat at high acoustic performances. The electrical leads are thin silver-coated vires attached by "Leitsilver" adhesive. The finished cell is installed into an intensity stabilizer. The device is used for digital and analog modulation in the visible spectrum up to 1-MHz frequency. Light intensity leaving the cell can be controlled by varying the intensity of the acoustic wave. Domestic production capacity is 500 cells per year. Figures 3; table 1; references: 2 Hungarian, 4 English.

8584

CSO: 2502/65

## BUILDING AUGER AND SIMS SPECTROMETERS FROM DOMESTIC RESOURCES, FOR THIN FILM AND SURFACE ANALYTICAL TESTS

Budapest FINOMMECHANIKA, MIKROTECHNIKA in Hungarian Vol 22 No 2, Feb 1983  
pp 60-63

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[Abstract] Quantitative determination of surface layer composition, depth profiling of composition changes and trace impurities at grain boundaries in metals are important in the communication technology industry and machine technology processes. Secondary ion mass spectrometry (SIMS) is much more sensitive (ppm range) than Auger electron spectrometry (AES) (1-3 atom layers) but is strongly matrix-dependent; it is advisable to combine the two methods. There are few AES-SIMS research facilities in Hungary, because purchasing the equipment requires much foreign currency. The Auger equipment developed at MTA MFKI is all domestic except for the ion gun and the electron energy analyzer (Riber OPC 103 CMA) (cylindrical mirror analyzer). Operating temperature has been extended to 2500°C. A large ultravacuum system was developed with a  $10^{-8}$  Pa operating range. The several references to bibliography deal with a large number of material tests, including most recently on NiCr thin film resistance. The SIMS equipment uses a Riber QML 51 quadrupole mass spectrometer. Much of the rest of the equipment was designed and built in cooperation with EIVRT (United Incandescent Lamp and Electrical Company). Gas samples can be taken by a portable device;  $10^{-7}$  Pa vacuum can be reached. The six-channel mass selector was developed by ATOMKI (Nuclear Research Institute). Mostly  $\text{SiO}_2$  and  $\text{Al}_2\text{O}_3$  thin films have been studied. A versatile (x-y-z and rotator) ultra-vacuum manipulator was also developed domestically. Much more work is planned for the near future in this area. Figures 5; references: 5 Hungarian, 9 English.

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## CATHODE SPUTTERING (PART II)

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[Abstract] Cathode sputtering is a combination of three processes: material emission under ion bombardment, ion generation and layer deposition simultaneously with ion bombardment. For microcircuitry applications it replaces the vacuum deposition technique due to its speed, except where high purity layers are needed. Layer properties also differ with the two methods and with the variety of the parameters (voltage, pressure, etc). High-energy ions slamming into the surface alyer dislodge some impurities but this purifying effect decreases when oxide are present. Layer density also increases. Newly deposited layers are homogeneous and it is possible to change the composition of some alloys such as GdCo when the gate energies of components differ. The pounding by ions and electrons causes some "damage"; in some cases this is undesirable (for example, grid disturbance in semiconductors) but desirable in others (development of a light magnetic axis in magnetic thin layers). Research is in progress in this area. The increase in adhesion is one of the most significant effects. Special coatings such as the TiC coating of tools are possible. There are very promising applications in metallurgy and the machine industry. The diode system is widely used with radio frequency gas discharge. This makes it possible to produce metallic, semiconductor and insulating layers. TaN, Ni<sub>81</sub>Fe<sub>19</sub> and GdCo layers and some insulators can be formed well by this process, and various geometric shapes can be coated well. A special magnetron process is needed for aluminum alloys (AlCu, AlSi, AlSiCu). Ion layer separation techniques provide interesting and promising results such as protective coatings made of BN and graphite-diamond variations, hydrogenated a-Si layers for solar elements, supraconductors, etc. Problems include the need to keep retuning the equipment, lack of pressure stability and changes in the ratio of reactive components of the remaining gases. Diode, triode and magnetron systems are in use. The system is a complement to rather than competitor of vacuum desposition. Figures 16, references 4: 3 U.S., 1 Austrian.

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